Fact Sheet

NO. 4 JANUARY 1999

Protecting Streambanks from Erosion

Tips for Small Acreages in Oregon

How Streams Behave - or Misbehave

Streambank erosion is natural. Some erosion is needed to supply gravel beds and inside point bars on river curves. But too much erosion can pollute water supplies, cover fish habitat, and threaten property.

When a stream is healthy, it balances water flow, the sediment it can carry, and its shape and energy (the same energy used in hydroelectric dams). Flowing water tends to move from side to side as seen in meandering streams. Stream meanders and plants growing along the banks reduce the erosive energy of a stream and trap sediment.

Any change in the watershed feeding the stream, in the floodplain, or in the stream itself can upset this delicate balance. The three major causes for increased streambank erosion are:

- **Land use change**. When we build houses, sidewalks, and roads over soil, we reduce the amount of water that can enter the ground. Consequently, water runs off faster, at higher temperatures, and with more erosive energy into streams. Streams become "flashy," erosive, and flood-prone. When we remove trees and vegetation next to a stream and allow livestock to trample banks, this exposes the soil. As a result, streambanks may erode more rapidly and slump into the water.
- **Dams**. When we build dams, the dams trap sediment and change the amount of sediment and energy in the stream below. Streams must move sediment, so the stream looks for a new source - the banks!
- **Straightening streams**. When we straighten a winding stream, we remove the meanders that reduce the erosive power of water. In the past, streams were channeled to move water quickly through flood-prone or erosive areas. But instead of solving a problem, it only moved the problem downstream with even greater force.

Streams are complex. In most situations, you should work with a professional to repair your streambank, so you don't throw money down the "drain." Read on for some guidelines to get you started.

Identifying Your Streambank Erosion Problem

The first step is to discover the cause of streambank erosion on your property. Here are three common causes:

Force of the stream.

Occurs at high water and is the major cause of bank erosion. Solutions for this situation are addressed in the fact sheet.

Ground water seepage.

Occurs at low water. Groundwater leaves the bank face and causes bank failure at the seepage point. Can also occur when floodwaters recede and the saturated bank collapses. This is a common problem in banks with fine soils. (This situation is not addressed here; consult a professional.)

Surface runoff.

Occurs during high runoff periods from rain, snowmelt, or flooding. Concentrated water flowing over the bank causes gullies. Often found next to roads, sidewalks, and parking lots. Can also occur when floodwaters re-enter a stream channel and cause failure in riprap structures. (This situation is not addressed here; consult a professional.)

"Mankind's strength and ultimate survival depends not upon an ability to manipulate and control, but on an ability to harmonize with nature."

- Rolling Thunder

USDA Natural Resources Conservation Service

Degraded streambank.

USDA Natural Resources Conservation Service

Streambank with vegetative buffer.

This fact sheet was produced by the Washington County Soil and Water Conservation District (SWCD) and the Small Acreage Steering Committee. The Governor's Watershed Enhancement Board, the Oregon Association of Conservation Districts, and the USDA Natural Resources Conservation Service funded the project. Media Works of Bozeman, Montana designed the fact sheet.

A Natural Solution: Soil Bioengineering

Soil bioengineering is a practice that uses plants alone or in combination with hard structures to stabilize streambanks. Hard structures armor the bank, but have hard surfaces that may increase erosion downstream and provide little wildlife habitat. When **rock, roots,** or **log** structures are combined with shrubs and trees, the plants hold the soil, slow water, filter pollutants, and provide food and cover for fish and wildlife.

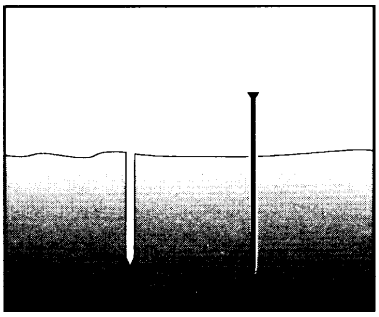
Bioengineering requires hand labor, planting during the growing season, and protection from animals, disease, and insects. Plants may take several years to become fully effective and cannot correct landslides. Soil bioengineering practices include brush mattresses, livestaking, log-wing deflectors, and planting shrubs with half-bank riprap.

Plant Materials for Bioengineering

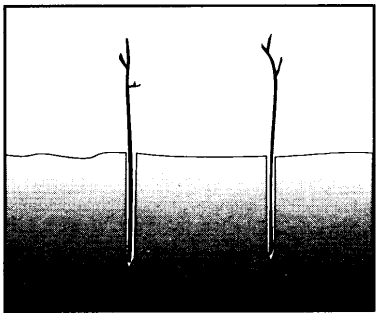
To select the right plants for your bioengineering project, note what native plant communities grow in your area. Avoid planting noxious or invasive grasses such as reed canary grass or ryegrass. Remove invasive plants such as yellow starthistle, English ivy, deadly nightshade, field morning glory, scotch broom, cheatgrass, and purple loosestrife. Use more of the same native plants in your bioengineering design, as these plants are most likely adapted to conditions to the area. Plants like **willow, red osier dogwood, alder, ash,** and **cottonwood** have the right stuff for bioengineering. They establish easily, grow quickly, and have thick root systems.

You can **buy willow and dogwood cuttings** from native plant nurseries. Or **collect cuttings** next to the project site, if the area is well vegetated. Other prime collection areas include ditches, abandoned fields, or utility right-of-ways. Do not take rooted native plants from the wild. This practice is unethical and survival is very low. One exception to this is rescuing rooted plants from construction sites. Be sure to get collection permission from property owners.

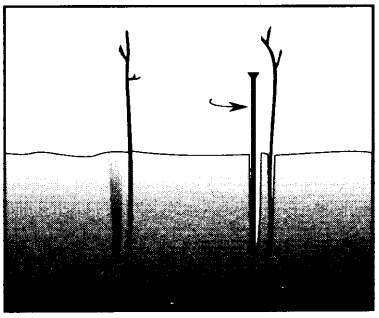
An example of how to plant willow cuttings is shown here. For information on planting and establishing native plants, see the agencies listed under "For Help." For information specific to the Willamette Valley, see the *Guide for Using Willamette Valley Native Plants Along Your Stream,* South Santiam Watershed Council publication, (541) 967-5927.



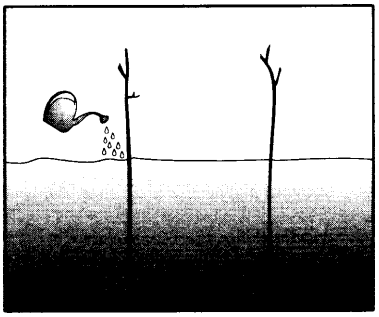
1. If soil is too hard for direct cutting placement, use a planting bar to create a hole. Make hole half the length of the cutting.



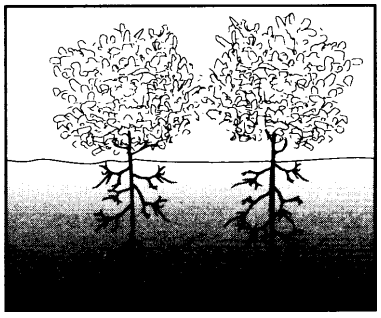
2. Insert willow cutting to the bottom of the hole.



3. Re-insert the planting bar adjacent to first hole and move bar toward willow cutting to close hole.



4. Water thoroughly.



5. Watch your willows grow and flourish.

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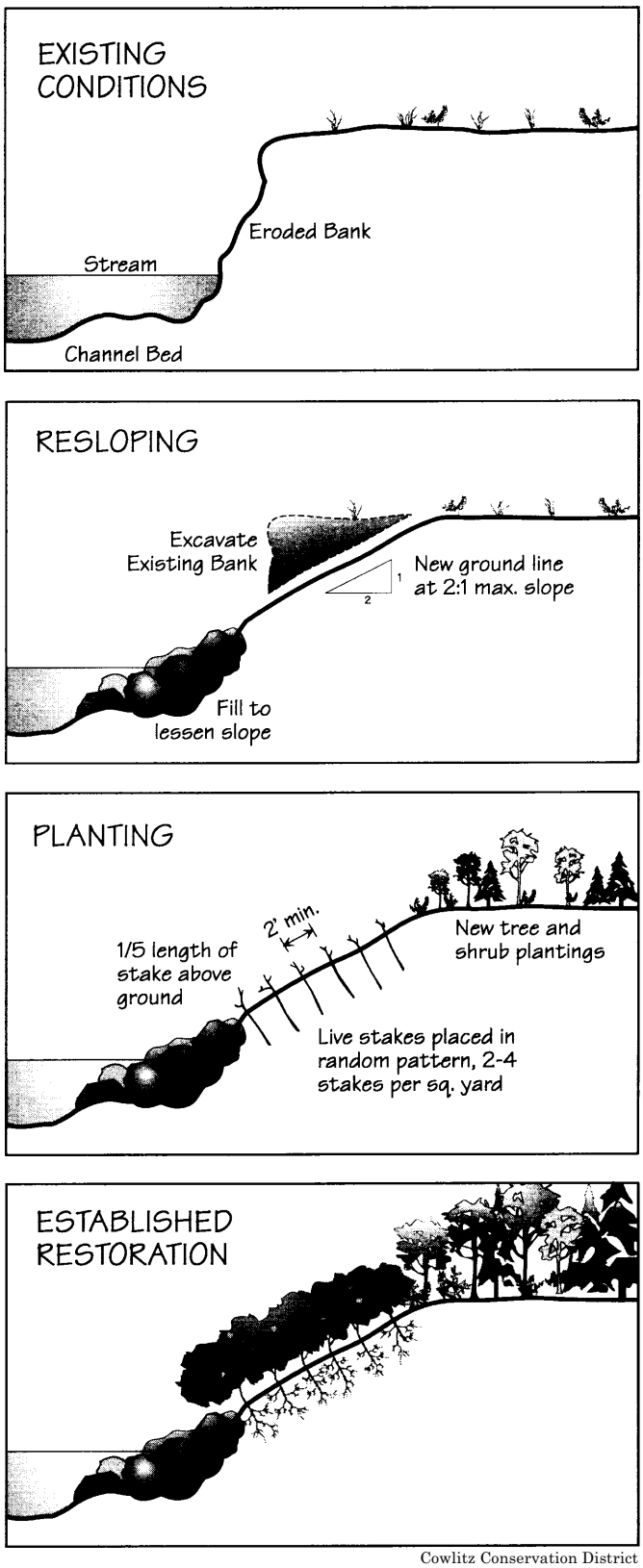
Protect Your Streambank "Toes"

Severe bank erosion almost always requires protecting the "toe" of the streambank. The toe lies at the bottom of slope and supports the weight of the bank. When water undermines the toe, the bank collapses. You can protect the streambank toe by using rock riprap, logs, and rock barbs combined with plants. One soil bioengineering example is shown here using rock riprap at the toe and live stakes on the slope. Protect the bare soil between structures with native grasses, sedges, and rushes. **Sprig plantings, grass seedings,** or **erosion blankets** may be needed to prevent erosion until shrubs and trees establish themselves. For more information on soil bioengineering, see your permitting agency or look up the following sources:

- *A Collection of Soil Bioengineering Drawings from the USDA Natural Resources Conservation Service,* http://www.wsdot.wa.gov/eesc/cae/bioengr/default.htm
- *Streambank and Shoreline Protection, Chapter 16, Engineering Field Handbook,* USDA Natural Resources Conservation Service.



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Stream-friendly Project Tips

Before Construction

- Involve your neighbors to increase project success
- Get the necessary permits
- Flag and avoid disturbing wetlands
- Preserve existing native trees and shrubs
- Cut trees and shrubs rather than ripping them out of the ground (many may resprout)
- Make a plan to replant disturbed areas and use native plants
- Install sediment-control practices (e.g., coffer dams)

During Construction

- Stockpile fertile topsoil for later use for plants
- Use hand equipment rather than heavy equipment
- If using heavy equipment, use wide-tracks or rubberized tires
- Work from the streambank, preferably on the higher, non-wetland side
- Avoid instream work except as authorized by the Oregon Department of Fisheries and Wildlife
- Stay 100 feet away from water when refueling or adding oil
- Avoid using wood treated with creosote or copper compounds

After Construction

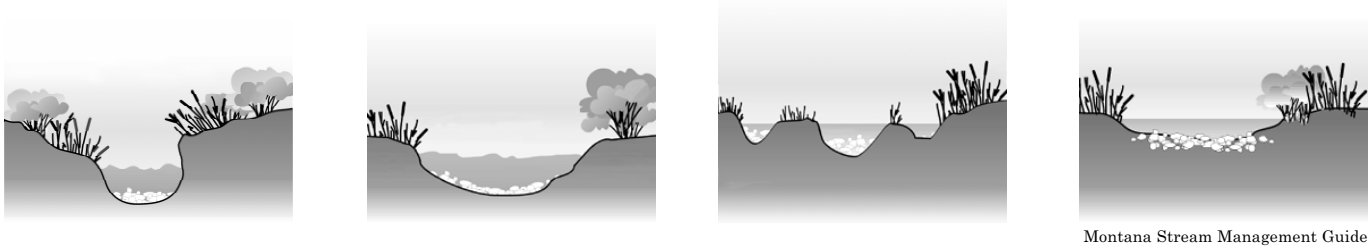
- Keep out people and livestock during plant establishment
- Check project after high flows
- Water plants during droughts
- Control grass until trees and shrubs overtop grass, usually two to three years

Streambank Stabilization Practices: Pros, Cons, and Costs

Practice	Advantages	Disadvantages	Cost
Change Management Make grazing and cropping changes that allow streamside plants to recover (e.g., fence out livestock or install a buffer that produces income).	Easiest to implement; natural recovery; diverse opportunities.	Results take time; may need long-term change in land use.	Low to moderate cost.
Replant Streamside Area Plant native shrubs and trees; reintroduce native grasses, rushes, and sedges.	Can be done with hand labor; has a natural, attractive look; increases wildlife habitat.	High labor needs; results take time; need streamside expertise; may require long-term change in land use.	Low to moderate cost (if labor is volunteered), $0.50-$10/foot.
Reshape Streamside Slope For slope stability, cut slope back to a minimum of 1 foot fall for every 2 foot in length (a 5:1 sideslope is best), reseed or cover with erosion blankets, replant with native shrubs and trees.	High chance of success; recovery of streamside habitat.	Requires design and installation expertise, heavy equipment, and labor; loss of existing vegetation.	Moderate to high cost, $10-$100/foot.
Install Soil Bioengineering Use bundles of brush, roots, or trees to cover banks. May include rock or other hard structures.	Uses natural materials; easy to install; may increase property values.	High labor costs; may not be adequate in streams with high flows; results take time.	Moderate cost, $5-$25/foot.
Install Jetties or Barbs Redirect water from banks with jetties or barbs.	When well designed, provides long-term stability; uses less rock than riprap; provides pool habitat for fish.	Difficult to design and install; may cause new problems across stream or downstream.	Moderate to high cost, $100-$1000 per structure.
Use Riprap or Gabions Cover banks with rocks and boulders alone (riprap) or with filled rock cages (gabions). Gabions are used on steep streambanks that can't be sloped back.	Very stable banks; may enhance habitat by adding logs and/or live plants.	Loss of streamside habitat; may increase erosion downstream; unnatural appearance.	Moderate to high cost, $40-$60/foot.
Move Stream to Original Channel Relocate to restore natural functions of stream. Extreme measure that requires careful planning.	Quickest recovery to full potential; replaces all functions.	High cost; must use professional consultants.	Moderate to high cost, $10-$70/foot.

*Costs are for comparison only and will vary depending on the situation.
Adapted from the *Montana Stream Management Guide,* Montana Department of Environmental Quality.

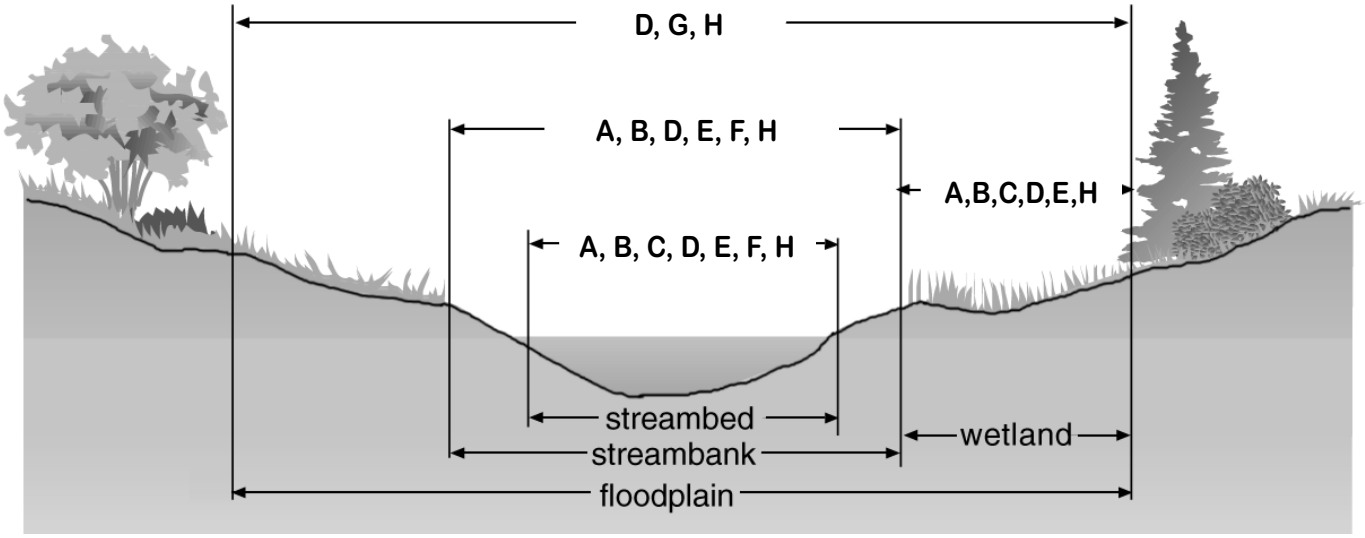
Common Channel Shapes



Montana Stream Management Guide

The Permits You'll Need

If you are working in or around water, you will probably need a permit from a local, state, and/or federal agency. Use this diagram to find out where your project will take place and what permits you may need. The State of Oregon and other permitting agencies prefer bioengineering practices to those that are solely rock or other hard structures. Since every situation is different, you may need to contact more agencies than those listed. Hint: to avoid migrating fish, the construction period for most stream work is permitted from July 1 to September 15 (or September 30 depending on the stream). Begin the permit process well ahead of construction time since the process can take a year or longer. See Filling Out a Project Permit, for more information.



Montana Association of Conservation Districts

Using this diagram, determine where your activity will occur. The letters refer to the permits listed below.

Permit	Government Agency	Phone
A. Removal or Fill Law (For projects that dredge or fill more than 50 cubic yards in state waters)	Or. Dept. of State Lands*	503-378-3805
B. Water Quality Certification (For projects regulated under the Federal Clean Water Act 404)	Or. Dept. of Environmental Quality	503-229-5546
C. Water Rights (For projects that take or use surface water or groundwater)	Or. Water Resources Dept	503-378-8455
D. Coastal Zone Certification (For projects that are west of the crest of the Oregon coast range)	Or. Dept. of Land Cons. And Dev	503-373-0096
E. Fed. Clean Water Act (404) (For projects that dredge or fill more than 50 cubic yards in state waters)	U.S. Army Corps of Engineers*	503-808-4371
F. Fed. Rivers & Harbors Act (10).. (For projects in navigable waters of the U.S.)	U.S. Army Corps of Engineers*	503-808-4371
G. Floodplain Corridor Designation . (For projects in the floodplain)	Local Planning Department	Local number
H. Other laws may apply (For projects that depend on specific activities and locations)	Various agencies	Various numbers

* The Oregon Dept. of State Lands (DSL) and U.S. Army Corps of Engineers (COE) have a joint application to avoid duplication. Send in a signed copy to DSL and a signed copy to the COE.

Montana Stream Management Guide

Logjams: Wood is Good

In the past, woody debris was removed from streams to drain floodplains, float timber, and allow boat traffic. Now we recognize some logjams are "good" and should be left alone because they have the following benefits:

- Provide cover for fish
- Stabilize channels by trapping sediment
- Redirect flow to create scour pools and open gravel
- Increase groundwater levels

However, woody debris can float downstream, collect, and create "bad" logjams. Hazardous logjams that are causing or could cause severe flooding or severe erosion should be removed. When removing woody debris, consider these stream-friendly tips:

- Work from the streambank and keep equipment out of the stream
- Anchor log debris to side for bank protection and aquatic habitat
- Salvage log debris for stream restoration projects
- Leave stump and roots behind when cutting down trees that may rip out banks

Remember! Removing woody debris from streams requires approval from the Oregon Department of State Lands. Other regulations may apply.

For Help

- The local soil and water conservation district (SWCD) and USDA Natural Resources Conservation Service (NRCS) may provide on-site advice and cost-share funding to plant, fence, and repair eroding streambanks. Contact your local SWCD and NRCS office for more information.
- Private consulting engineers may obtain permits on your behalf, design projects, and help you meet your streambank protection goals. Check the yellow pages in the phone book for consultants.

A Buffer is the Best Long-term Protection

A streamside buffer of trees, shrubs, and grass protects land and water in the following ways:

- Slows floodwaters
- Blocks flood debris from entering fields
- Protects banks
- Filters overland pollutants
- Provides wildlife habitat

Buffers work! Studies show that a dense tree stand at the top of the bank can cut down meander erosion in half. Consider preserving or planting trees and shrubs near your stream.

Do Not Install Used Construction Materials

Broken pavement, car bodies, asphalt slabs, concrete blocks, bricks, rotting lumber, and scrap metal are impractical to sort by type and impossible to anchor to streambanks. These materials can float downstream, leach pollutants, and lower property values with their presence. They have flat, hard surfaces that do little to dampen the erosive power of water. Dumping many of these items near or in water may be illegal and result in fines.